

face of or inside the braille cells is effective for decomposing bacteria, sweat, oil of the hand, food particles and the like on the braille cells.

[0288] As described in the foregoing, the tactile pin holding mechanisms or apparatuses according to the EMBODIMENTS of the present invention can simultaneously hold plural pins together, using, for example, elastic members annularly arranged on e.g. a rotational member, or rod-shaped elastic members arranged between pins, or compression coil springs arranged between pins. Further, with the aid of ring-shaped members (O-rings) each fit to each pin, each pin can be held at an arbitrary positions (height from tactile surface) in the up-and-down movement of each pin. Furthermore, such pin holding at an arbitrary position can also be accomplished with the aid of elastic holding members such as flat springs.

[0289] Each one of the tactile pin (braille) display apparatuses according to the EMBODIMENTS of the present invention can allow a user (visually handicapped) to be able to touch them as if the user touches a braille book or braille paper, owing to the use e.g. of: one of the pin holding mechanisms or apparatuses; actuators distantly placed nearby a rotational member; a mechanism for moving the pins in the first direction (D1) to the initial reset position or allowing the pins to stay at the reset position by using e.g. a rotatable roller, thereby positioning all the pins at the reset position; and a mechanism for selectively moving the pins in the second direction (D2) to positions different from the reset position by driving the actuators, which are driven at timings different from each other if necessary.

[0290] Furthermore, differently from the case of displaying (touching or reading) and refreshing one line (braille line) at a time, it becomes possible according to the EMBODIMENTS of the present invention to continuously display (touch or read) any desired number of pins (pin cells or braille cells), namely any desired lengths of sentences, on e.g. a rotational member such as a rotational disc.

[0291] Moreover, the tactile pin display apparatuses according to the EMBODIMENTS of the present invention including the pin moving mechanisms and the pin holding mechanisms can be constructed very simply, and realize reductions of size, weight and cost thereof. As a result, it becomes possible for users (visually handicapped) to conveniently use and easily buy such apparatuses. Accordingly, it becomes possible to widely spread such apparatuses to public facilities such as libraries and transportation stations.

[0292] In addition, the tactile pin display apparatuses according to the EMBODIMENTS of the present invention can be used as braille display terminals coupled to personal computers for reading internet home pages, or coupled to cellular phones or PDAs (personal digital assistants) for mobile internet applications. Needless to say, they can also be used as braille display terminals for various electronic equipment such as ticket-vending machines, ATMs (automated teller machines) for money, vending machines, electronic book readers, facsimiles, braille learning apparatuses, electronic voting machines and navigation systems.

[0293] Besides, by providing photocatalysts or photocatalytic effects to tactile or braille pins and rotational members to movably hold the pins (such pins and rotational members being examples of braille display members), it becomes

possible that contaminants deposited thereon, such as bacteria, sweat, oil of the hand and food particles, can be decomposed, thereby keeping the tactile surfaces (surfaces of the braille display members) clean, and that the pin sliding movement (sliding movement of the braille display members) can be constantly stabilized. Furthermore, by providing a lubricant material to each pin sliding portion, it becomes possible to stabilize each pin holding force and each pin sliding movement as well.

[0294] The present invention has been described above using presently preferred embodiments, but such description should not be interpreted as limiting the present invention. Various modifications will become obvious, evident or apparent to those ordinarily skilled in the art, who have read the description. Accordingly, the appended claims should be interpreted to cover all modifications and alterations which fall within the spirit and scope of the present invention.

What is claimed is:

1. A tactile pin holding apparatus comprising:

a holding member having a tactile surface and a first number of holes, and being provided for supporting the first number of tactile pins in the holes, respectively, to be movable up-and-down therein relative to the tactile surface for displaying characters and/or graphics, the tactile pins being arranged in multi-row multi-column and in a second number of groups at the tactile surface, the second number being smaller than the first number; and

elastic members, in the second number, respectively corresponding to the second number of groups of tactile pins and being arranged at the holding member for pressing and holding the tactile pins with the holding member in a manner that each of the tactile pins in each of the groups of tactile pins is pressed at one side thereof by the elastic member corresponding to the each of the groups of tactile pins and can thereby be held at a desired height relative to the tactile surface, and that the each of the tactile pins is movable up-and-down when a force exceeding a given value is applied to the each of the tactile pins in up-and-down direction.

2. The tactile pin holding apparatus according to claim 1, wherein the second number is the number of rows of tactile pins, and each of the elastic members provided for each of the rows of tactile pins is an elastic ring placed annularly at the holding member for pressing, at one side thereof, and holding each of the tactile pins in the each of the rows.

3. The tactile pin holding apparatus according to claim 1, wherein the second number is equal to half of the number of columns of tactile pins, and each of the elastic members is an elastic rod extending in column direction and being sandwiched between a pair of adjacent columns of tactile pins in a manner that the tactile pins in one column of the pair of columns are pressed and held by one side of the elastic rod, and the tactile pins in the other column are pressed and held by the opposite side of the elastic rod.

4. The tactile pin holding apparatus according to claim 1, wherein the second number is equal to half of the number of tactile pins, and each of the elastic members is an elastic segment sandwiched between a pair of adjacent tactile pins in each row in a manner that one of the pair of tactile pins